

## Survey

### **EAP 1063: Pilot Project on Vernacular Mathematics in Pre-modern India**

The primary objective of this pilot project was to identify all possible kinds of historical sources in the languages of Tamil and Malayalam, concerning mathematical practices among various occupations, communities and institutions of teaching and learning. The material includes a variety of pre-modern mathematical sources, which reflect the entire textual scope of vernacular mathematical cultures:

- Palm leaf manuscripts of mathematical treatises in vernacular languages
- Palm leaves of village level revenue and temple account registers
- Accounts of private bankers and communities
- Manuals of merchants, accountants and artisans (e.g. sculptors, boat makers)
- School and pedagogical mathematical texts from the precolonial period.

### **Institutional Collections**

The priority of the project was to create a database of existing materials, first in institutional manuscript collections and then with private and family collections. Our methodology for institutional collection was to begin with a comprehensive survey of published and unpublished catalogues of the institutions known to be housing manuscripts. Then to follow them up with direct physical inspection of actual availability of the manuscripts in these institutions, collate the database and ascertain the access conditions in their institutions as well as explore possibilities for digitisation and sharing on public domain.

Based on the initial survey, we identified twenty institutions, which had the resources related to our project and in the process identified about 1700 manuscripts related to different kinds of mathematical practices in about seven languages. The table in Annex I gives the list of the institutions that we surveyed and the number of manuscripts and their language. For those institutions that we have been able to complete the survey, we have listed the data of the material available in these institutions in the accompanying listing templates as suggested by the EAP team in the British Library. In practice, this completed survey means that we had managed to gain access to physically examine and collect relevant data in order to complete the database. This also includes information about possibilities or otherwise for digitisation in the future. Following the table in the Annex I, we would like to explain a few of our experiences during the execution of the project.

In the case of the Thanjavur Tamil University, we did not have physical access to the manuscript collection, but we were shown the digital copies. So, we have completed the database with the information that we could mobilise from the digital versions of the manuscripts. However, it needs to be mentioned that the digital images they provided are not to the standards set by the EAP Guidelines and also we were strictly asked to keep it for institutional access at the French Institute of Pondicherry. But, we still have the database

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with partial information that could be made available to the public. The work with this university needs to continue, primarily because of the very important collection of revenue account manuscripts they hold.

Pudukkottai: 500 bundles

Thanjavur: 20 bundles

Chenglepet: 200 bundles

Sengottai: 200 bundles

Mannarkudi Rajagopalasamy Kovil: 10

Mettuppati Zamin Accounts : 100

Nagappattinam: 10

Each bundle would have about 500 leaves in them. As is evident from these photographs below, it is a room full of manuscripts waiting in desperation for some preservation measure. The French Institute of Pondicherry since has initiated dialogue with them and we have signed a formal Memorandum of Understanding with the Vice Chancellor of the University that will allow us to explore working together. We hope that we will be able to find some mechanism by which these manuscripts could be preserved and digitised.





In case of the Saraswati Mahal Library in Thanjavur, there were a lot of discrepancies between the catalogue and the actual availability of the manuscripts, but it is only after a stay of several weeks that we could finally gain access to their manuscripts, in order for us to complete the database. We noticed that they were undertaking their own digitisation by outsourcing it to a firm while we worked there.

But the important discovery during our work was that there were revenue accounting manuscripts of two districts, Pudukkottai and Sivagangai which were present in the library but we were denied access to them. Saraswati Mahal Library holds about 200 bundles of revenue accounts for the districts of Pudukkottai and about 50 bundles for the district of Sivagangai. The revenue account manuscripts, we had argued in our application was an important resource for historians and the programme that we are trying to shape. It was unfortunate that we could not see these manuscripts. However, over time, we are hopeful that we will be able to persuade the library about their importance and slowly negotiate with them a possibility to gain access and hopefully digitise them, since they do require urgent attention and conservation measure of some sort.

In the case of the Government Oriental Manuscripts Library, Chennai, which unquestionably is the home for the largest number of manuscripts for our purpose, we unfortunately have not been able to gain access to their collection, neither for physical access to complete the database nor to their digital versions of these manuscripts. This is the single most disappointment for us given the huge amount of time and effort that we had invested right from the beginning of the project to negotiate with the institution. The library comes under the Government of Tamil Nadu's Department of Archaeology and despite repeated submission to its Commissioner, following the paper trail from the Commissioner's Office to the library, to its own several departments for clearance and then back to the Commissioner's office, we still have not received a response to our request. We will continue to pursue our case with them and will do our best to make the database of the manuscripts in their collection, complete in the coming months. Our commitment to complete the survey and the database is firm in this regard, and we shall not give up on that task, given the enormous time and resources we had invested in procuring access, which in principle, cannot be denied for a research oriented project, such as ours.

Apart from these major institutional collections, we have managed to survey all relevant institutional holdings, even if they had a single manuscript, as in the case of the monasteries in Erode, Madurai and Coimbatore. The positive outcome of focussing on these smaller collections is that we have been able to gain access to digitise some of their manuscripts as samples like with the Madurai Tamil Sangam Library. In certain cases like the Adyar Library and Research Centre, we had to procure digital copies of their manuscripts in order for us to complete the database. In the case of Sri Venkateshwara University, Thirupati, we were fortunate enough to gain both physical access as well as to digitise their manuscripts.

In the case of the Tamil manuscripts, we have now a fair knowledge of institutional collections of manuscripts that are of use to us, because of the Pilot Survey. But on the whole, none of the institution are willing to share digital access to their manuscript collection, especially to be hosted as part of the EAP platform. The reason for that is that they have all digitised manuscripts on their own and do not particularly appreciate the idea of digitising them again for the reason that they do not meet certain standards, like that of the EAP. Major collection holders like the GoML, Chennai, Saraswati Mahal Library, Thanjavur, the Tamil University, Thanjavur, Adyar Library and Research Centre, Chennai and the French Institute of Pondicherry all have digitisation projects completed or ongoing. But at least we have the listing templates for the database completed for these institutions and that will be a valuable resource for scholars and students in itself.

### **The case of Malayalam**

It was our objective to focus on both Tamil and Malayalam languages for the pilot survey. In our application, we had mentioned even the number of Malayalam manuscripts present in the state of Kerala in respective institutions. The three major institutions were the Oriental Research Institute Library of the Kerala University, Trivandrum, the Calicut University's Thunchan Manuscript Library and the Thiruppunithura Sree Rama Varma Sanskrit College Library. It is the most unfortunate part of our project that none of these institutions provided us access to produce a database of their collections. The ORI, Trivandrum after several meetings and communication, finally communicated to us officially that they will not be able to cooperate with us because of the reason that we were doing a project. Over several visits to their Library, we managed to gather the information about some of the manuscripts and we have provided the data for those manuscripts. But due to some controversy involving some other scholar from the USA, we could not gain access to their Library. The Registrar of the University officially communicated to us that they will not be able to allow us to access their manuscripts. One of our colleagues, Vrinda, tried to attempt the transcription of the manuscripts but she was denied permission as an individual scholar to do that.

The Calicut University after several requests and some pressure on them through known academics in the state of Kerala, appointed an internal committee to decide if they could share their manuscript collection with our project. After eight months, they copied us in their internal correspondence demanding a reply from the members of their committee who had remained silent and still have not responded either to their own administrative head or to us. Meanwhile, Vrinda, our colleague was again refused to do the transcription of the manuscripts in her individual capacity.

So, the Malayalam part of our project due to this very exhausting and time consuming process of following up with these two major collections received a setback and we honestly are quite clueless as to how we could complete the task, given such blatant cynicism and denial of cooperation, even with reputed institutions such as the French Institute of Pondicherry.

Our other objectives in the state of Kerala was to look for revenue accounts and temple accounts, such as that of the Padmanabaswamy Temple in Trivandrum. In the case of the latter, we came to know that the administrative head of the temple was still the royal family associated with it and due to certain recent controversies in relation to the asset management of the temple, our requests for a meeting or a consultation was not entertained. We did learn that some of the Travancore state records of the revenue administration were later shifted to the Oriental Research Institute's Manuscript Library. We will have to upkeep our effort to work with that very important Library in order for us to know if the Travancore state revenue accounts and temple accounts are still there.

### **The Hindi Project**

The other component of our Project included the historical sources in the Hindi language at the Amiruddaula Library (Lucknow), the Munshi Newal Kishore Press Collection (part of the Amiruddaula Library), and the IIT Roorkee Central Library (Roorkee). We had other two institutions in our plans, the Arya Samaj collection at the Sabji Mandi and the railway workshop at Charbagh in Lucknow, much to our disappointment, access to us was denied.

In these two institutions and as mentioned below, several texts were found, which require preservation and digitisation, covering texts in English, Sanskrit, and Urdu language. Because of our limitations with the languages of Sanskrit and Urdu, we could not gather all the details about these texts, but we have nevertheless listed the titles and wherever possible a little detail about the text.

Hindi material found at the Amiruddaula Library - including in the Munshi Newal Kishore Press Collection, included: texts on astronomy; history of Indian mathematics; primers on arithmetic; mensuration, and geometry; an encyclopedia of mathematical terms; Hindi translations of prominent English mathematics textbooks; 'Hindu' mathematics; Indian origins of Algebra; texts on probability; village accounting; a PhD thesis on the history of series and progressions; a pocketbook of practical mathematics on how to calculate money and measure objects and various textbooks on mathematics intended for the university graduate. In Sanskrit, we found few manuscripts on: building construction, on predicting the movement of astronomical bodies, on predicting day-night, seasons, months, and years, and Jain mathematics in predicting ascendant (lagná), zodiac (ráshi) and planetary bodies (grah). The library looks forward to digitising its material and is willing to co-operate providing permission is granted from the Government's Secretary to the Department of Culture, of the state administration of Uttar Pradesh. Prior to this, they did not seem very sure of the copyright status of their materials that they hold and they are of the opinion that they would have to take legal expertise to ascertain the possibilities before they could commit in any manner. One of the challenges will be to relocate the material we found for the fear of loss of the materials. Although the head librarian, Smt. Shashi Kala, is sure that the material will be easy to locate in future, we fear that it might be moved or mislaid, due to the poor condition of a few of the texts and improper cataloging.

The second institution that we covered during the Project was the Mahatma Gandhi Central Library, IIT Roorkee. At this library/institutional archive; texts on the following subjects were found: a practical treatise on the construction of bridges over Indian rivers; mathematical texts on revenue survey; the Thomason Civil Engineering College (the first engineering college in north India) manuals on building construction; iron bridges; civil engineering; drawing; limes; mortars and cements; and carpentry; the colonist's handbook of mechanical arts; surveys of the Trigonometrical Survey of India (1869-70); the public work calculator; tables; land surveying; the American system of commercial bookkeeping; engineers' papers; mathematics exam paper of the Thomason Civil Engineering College; timber measurement tables; on earthwork; embankment and excavation; irrigation work; elementary calculus; mensuration and algebra primers; and topographical surveying. It also includes various drawings and photographs (uncatalogued) of engineers working bridges; canals; and railways lines. This material is located in the basement of the library in the archive room. The library is willing to digitise its material and willing to co-operate.

### **Private Collections**

There were two kinds of manuscripts we were expecting from private collections; accounting books of merchant communities, which is very important for our project and household accounts of landholders or small traders. On both these counts; we were right in our anticipation. We approached four families in the Chettinad region in the state of Tamil Nadu and after discussions; we have managed to secure access to one family's very important collection of their banking accounts, which are maintained both in notebooks as well as in palm leaves. As the pictures below show, this family collection itself is substantially large enough for us to focus, both as a conservation project as well as to make them available to scholars interested in this aspect of the history of mathematical practices. The family has informally agreed in case we develop a project to conserve and digitise their collection of manuscripts and accounting books. The other three families are still considering granting access. Since they all live in other cities, it is only during annual temple festivals or family occasions one could manage to meet them and their own family members meet each other on such occasions. The three families will let us know their decisions soon about sharing their collections with us.

*Chettiyar account documents available at Kottaiyur, Karaikudi, Tamilnadu*

















The other significant effort was that of exploring the accounting books of Coromandel Muslim merchants in two places, in Keelakkarai and Kayalpattinam. Just as in the case of Chettinad area, even here families meet rarely. We have gained the confidence of a local voluntary organisation, very interested in historical matters. They have promised us cooperation with the concerned families to see which families still retain their accounts, and will work with us to gain access to them. The interesting aspect that resulted out of this dialogue is that we have learned that these merchant communities trained themselves both in the Khulasat tradition of Islamic account keeping as well as the Tamil tradition of account keeping and there were specialised institutions, which trained them in both these traditions. We know that the Khulasat manuscripts are available in the GoML, Chennai but we have also been notified of their possible presence in some of the madarsa institutions like the Baikat Madarsa in Vellore town, with whom we have initiated correspondence to visit and explore cooperation. WE have also visited the Kottakkuppam Madarsa in the Viluppuram District of the state of Tamil Nadu but we are yet to find anything significant in their collection. However, the possibilities in this direction are promising even if we manage to secure some of the primers and manuals of account keeping from these libraries and institutions. We were also pleasantly surprised with the discovery of an account book of a fish trader from the early twentieth century from the town of Kayalpattinam, which was another historical trading centre on the Coast.

### **Major findings**

One of the most rewarding aspect of this pilot survey of mathematical manuscripts in Tamil and Malayalam languages is that we now know the range and diversity of historical materials that could be mobilised to write a social history of mathematical practices in south India. As we had envisaged while conceiving this project, such historical materials include several versions of Tamil and Malayalam mathematical treatises, which can be grouped under the rubric of the Kanakkatikaram genre. Not only that we know where and what kind of these texts exist, it is now possible to map the several editions and versions of these texts so as to prepare ourselves for the long term task of critical editions and publications of these texts into the public domain.

The second interesting aspect of this study for historians is the surprisingly large amount of manuscripts concerning architecture, which are often called the Manaiyadi Sastiram or Manai Alankaram, which as we had mentioned in our earlier survey had hardly received much attention from historians. They are very important to understand practical mensuration in relation to different occupational groups that were involved in the making of houses. Along with these, we have also seen an interesting set of Cirpa Sastiram texts, which deal with the art of sculpting and temple architecture.

The school books and primers that we expected to get in large numbers did not materialise as much as we expected, probably because the institutions did not find it necessary to house all of them, and only retained a few. There were few available like in the Thanjavur Tamil University collections, which is made of collected sources from different parts of the state, from individuals and families.

The accounting books of merchant communities is the next important finding. The households of the Chettiar Community in the Karaikkudi region, called the Chettinad retain their books and some families, even palm leaves. These were trading communities that had commercial interaction with the countries of South East Asia since the late nineteenth century and much more during the inter war period. We have gained access to the archives of one of the most well known families from that region and we hope to get access to more of them. This family's' collection itself is substantial in its own right.

The second interesting archive of merchant communities is that of the Coromandel Muslims and during this phase of the Project, we were only able to establish contacts with certain individuals and organisations from the towns of Keelakkarai and Kayalpattinam. It takes time to gain their confidence, which in effect means repeated trips and stays with them. We have succeeded in that and we are looking forward to get some interesting documents from certain families in these two towns.

The last but the most important finding is the huge amount of work that needs to be urgently undertaken in the conservation and digital publication of the revenue account manuscripts. We have already mentioned how they desperately need attention in the case of the Thanjavur University collection, which is the single largest collection of village accounts in the region. Next is that of Saraswati Mahal Library's collection of two districts and that of a few monasteries and temples. The third is the Palace accounts of the Sivagangai minor court. These together constitute a very important resource for the historical reconstruction of mathematical practices.

### **Possibilities**

In the case of institutional holdings, it is our experience and conclusion that we have to make do with their digital versions. For those institutions, which still have not done, they are in the process of doing it or expect to complete their work in the near future. We do not think it is necessary to duplicate that effort, nor are they willing to do that. But we have to provide the relevant information about their collections in our database and make it available in the public domain.

In terms of further digitisation initiatives, two concrete cases are necessary and possible. One is the Thanjavur Tamil University's collection of revenue account manuscripts. We will have to encourage them to undertake the digitisation, since the Department of Manuscriptology in that University which is responsible for that collection and they do have the necessary expertise and experience in handling such a task, provided they get financial support. This is clearly a mammoth task and will take at least three years to complete the digitisation and we as historians are clearly committed to facilitate such an effort if the British Library agrees to commit itself to this task.



The second concrete possibility is the digitisation of the Chettiar family collection, of both palm leaves and account books and they have in principle committed provided we undertake the responsibility for the process. This will be useful given that this will open new doorways to the collection of other families from the region.

We are not yet sure of the quantum of manuscripts and sources from the Muslim merchant families of the Coromandel Coast, but we doubt that it will require a major digitisation effort, since most families had already destroyed their accounts, not to mention the fact that these communities had a convention of taking bundled account registers every year and conduct a ritual and dump in the sea.

#### Annex I

S.no.	Institution Name	No. of manuscripts	Tamil	Malayalam	Grantham	Kannada	Arabic	Telugu	Devanagiri	Persian	Access permission status
1	Government Oriental Manuscripts Library, Chennai	627	247	2	28	8	103	56	1	138	Awaiting Government of Tamil Nadu permission for access
2	Oriental Research Institute And Manuscripts Library, Kerala University, Trivandrum	477	33	53							Survey completed but access limited for Malayalam

3	Tamil University, Thanjavur	188	188								Access issues but few digital copies procured
4	Dr. U. V. Swaminathaiyar Library, Adyar	20	20								Survey completed, no digital access
5	Adyar Library and Research Center, Chennai	38	38								Survey completed, digital copies obtained
6	Annamalai University, Chidambaram	4	4								Surveyed
7	Madurai Kamraj University, Madurai	1	1								Surveyed
8	Sri Venkateshwara University, Thirupati	16	16								Survey completed, sample digital images obtained

9	Thavatiru Sandhalinga Adigalaar Tamil College, Perur, Coimbatore	4	4								Survey completed, digital samples obtained
10	Kalaimagal Kalvi Nilayam, Erode.	2	2								Survey completed
11	International Institute Of Tamil Studies, Chennai	3	3								Survey completed
12	National Library, Kolkotta	3	3								Access Requested
13	Fourth Tamil Sangam, Madurai	1	1								Survey completed, sample digital copies obtained
14	Saraswati Mahal Library, Thanjavur	81	81								Survey completed, no digital copies or access possible.

15	French Institute Of Pondicherry, Pondicherry	30	30								Survey completed, digital samples acquired
16	Thiruvadudurai Adinam	8	8								Survey completed, but no digital access possible.
17	Mounasami Madam, Chidambaram	4	4								Survey completed, no digital access possible.
18	British Museum, London	3	3								Not done
19	Thunchan Manuscripts Library, Dept. of Malayalam & Kerala Studies, University of Calicut	22	22								Awaiting Permission from the University, but negative so far.

20	Sree Rama Varma Government Sanskrit College Grantha Library, Trippunithura	7		7							Awaiting Permission
	<b>Total</b>	<b>1539</b>	<b>686</b>	<b>84</b>	<b>28</b>	<b>8</b>	<b>103</b>	<b>56</b>	<b>1</b>	<b>138</b>	